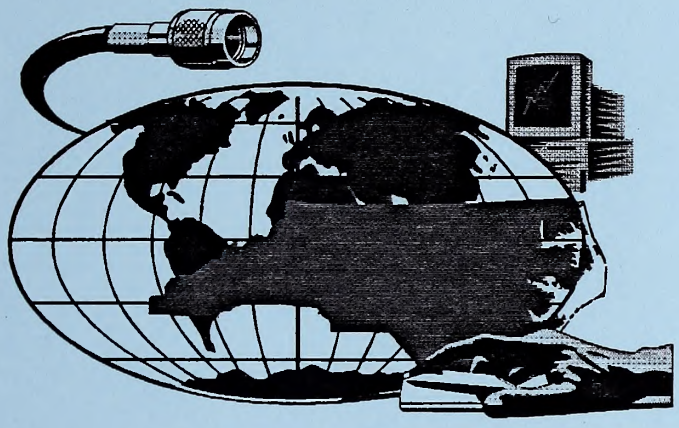
# IRMT REVIEW AND RECOMMENDATIONS FOR DEHNR INFORMATION TECHNOLOGY MANAGEMENT

## VOLUME I - RECOMMENDATIONS



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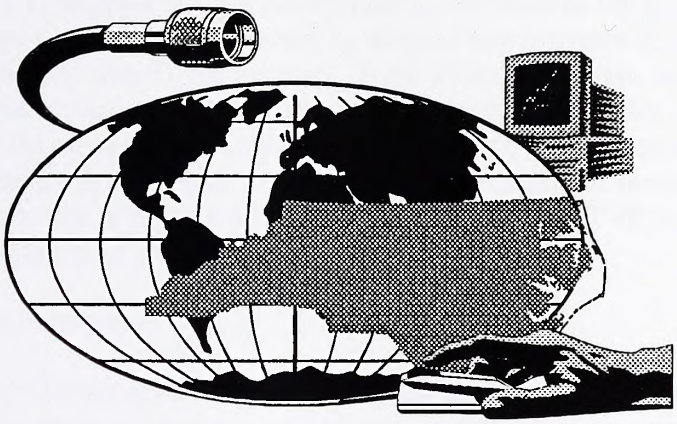

DEHNR

North Carolina Department of Environment, Health, and Natural Resources
James B. Hunt, Governor
Jonathan B. Howes, Secretary

# EXECUTIVE SUMMARY

DEHNR's mission is: "To promote, protect, and conserve the environment, health, and natural resources of North Carolina and its citizens through responsible stewardship and excellence in public service." At the heart of this mission is the management of information -- to monitor and regulate pollutants, to track childhood immunization, to develop and improve environmental indicators, to streamline permitting, to observe communicable diseases, and so forth. For a service organization, peopled by knowledge workers, information technology (IT) is not only an important tool, it is absolutely essential. Where the IT function is well-conceived and supported, program personnel can respond rapidly to changing legislation, public opinion, and can move quickly to realize strategic organizational objectives. To the degree that IT services are poorly executed, the Department of Environment, Health, and Natural Resources (DEHNR) program flexibility and responsiveness suffers. At the extreme, where IT systems fail, the provision of information and services by some of the department's programs may cease.

To assure adequate, responsive IT support of DEHNR operations, the Information Resource Management Team (IRMT) recommends that a new computing model be adopted that provides all essential regulatory and service IT functions for an up-to-date IT environment. Some of these functions would be located centrally providing services that cut across divisions and provide support for smaller divisions. Others would be located in the larger divisions and would provide services for their respective divisions. The objective of these recommendations is to enhance IT responsiveness to customer needs by increasing funding for IT in the department, encouraging a more integrated and flexible IT effort, and putting IT professionals as close to the customer as possible.

More specifically the IRMT recommends:

- Establishing an Office of Information Resource Management to develop departmental IT plans, establish departmental policies and procedures, and monitor and sanction compliance.

- Reconstituting the Division of Computer Systems, adding several information technology management (ITM) functions and relating changes in staff size more closely with demands from new and existing functions.

- Establishing departmental policies and procedures to foster ready access to information across the department, assure proper skills for both IT professionals and for end users, and secure IT assets.

- Identifying detailed criteria and carefully developing detailed plans for the reorganization of the existing application development function and departmental local area network (LAN) administration.

The IRMT believes these recommendations to be promising and to have far reaching implications for DEHNR operations. However, they must receive strong, continuing senior management support if they are to succeed.

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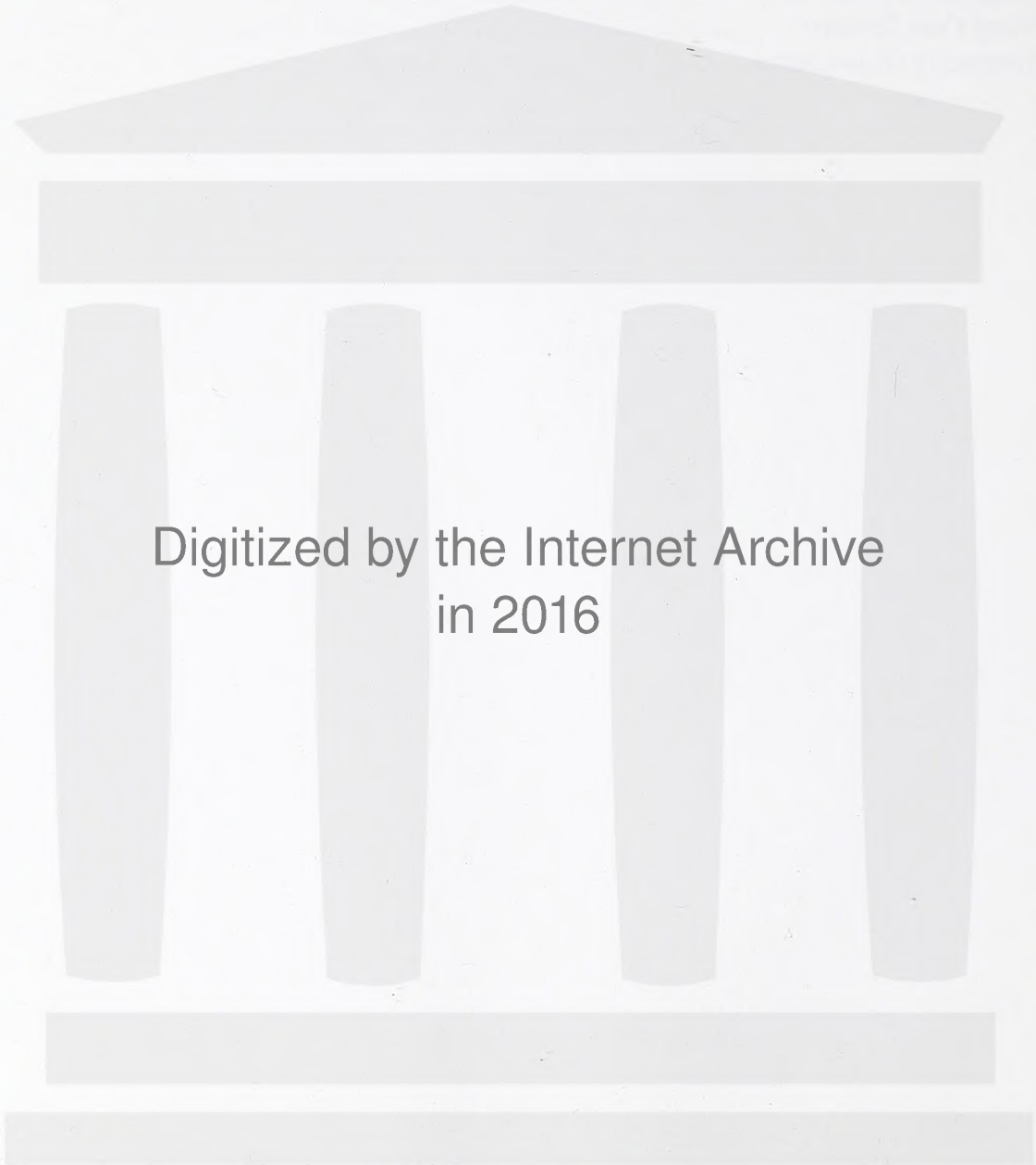


# INTRODUCTION

## *Background*

Senior Department of Environment and Natural Resources (DEHNR) management is aware of the value of information technology (IT) in the realization of DEHNR's mission and stated goals. For a service organization, peopled by knowledge workers, IT is not only an important tool, it is absolutely essential. Where the IT function is well-conceived and supported, program personnel can respond rapidly to changing legislation, public opinion, and can move quickly to realize strategic organizational objectives. To the degree that IT services are poorly executed, DEHNR program flexibility and responsiveness suffers. At the extreme, where IT systems fail, the provision of information and services by some of the department's programs may cease.

With this in mind, DEHNR management has embarked on a careful review of existing IT functions. Initially, a white paper was developed which reviewed the current provision of IT services by the Division of Computer Systems (DCS). The object of this assessment was to identify and assess current issues and to develop an organizational response. In general, this review found that:

- DCS is badly under funded. Staffing is well below requisite levels to support existing systems and to engage in any significant systems development. IT training is almost nonexistent in a field with dramatic technological advances. Although some members have kept up with changes through personal initiative, many staff members are not well versed in recent advances. Some are not well informed about DEHNR programs and their needs. They are also unfamiliar with key Information Resource Management Commission (IRMC) requirements such as project management, quality assurance, business planning, etc. and how best to implement them. Facilities, including hardware and software, are inadequate. In some cases the IT facilities are poorer than those of divisional staff.

- The role of DCS is poorly defined leading to unrealistic expectations. Originally, the DCS role was primarily to support mainframe, production applications (e.g. permitting). Over time IT has evolved from a production environment to one that also includes office automation, networking, and decision support systems as well as production. Further, with this evolution has come a dramatic increase in user expectations and demand for IT support. DCS has attempted to respond to this demand. Although a few staff have been added to provide a wider range of services, DCS has responded primarily by expanding the responsibilities of

existing applications support personnel, generally without funds for formal training and in an ad hoc manner. Inevitably, existing IT personnel have been stretched thinner and thinner leading to greater user dissatisfaction.

- Some critical IT functions don't exist (e.g. data administration) and others are only marginally performed given the lack of resources. Again the funding and organization of DCS does not recognize the demands of the evolving IT environment and the associated increase in user demands.

- In a complex, heterogeneous, often technical environment like that at DEHNR, a flexible, well-integrated set of IT services is essential. Otherwise, the proliferation of different software, different operating systems and hardware, different data sets and naming conventions, etc. frustrates any easy sharing of or cross divisional access to information. DCS has been charged with developing and enforcing standards to foster this integration while not having the authority or management support to do so. Thus, though some standards have been developed, the DEHNR environment is becoming increasingly heterogeneous discouraging the effective sharing of data and fostering greater duplication of IT technologies and services. These problems have eroded DCS involvement in the business planning at both the departmental and the division levels, effectively disconnecting the desired link between DEHNR's business and information technology management (ITM) planning.

Given these issues and various organizational constraints, the white paper recommended that a new computing model be adopted that provides all essential regulatory and service IT functions for an up-to-date IT environment. Some of these functions would be located centrally providing services that cut across divisions. Others would be located in the larger divisions and would provide services for their respective divisions. The objective of these recommendations is to enhance IT responsiveness to customer needs by increasing funding for IT in the department, encouraging a more integrated and flexible IT effort, and putting IT professionals as close to the customer as possible.

### *Information Resource Management Team (IRMT)*

In response to the findings of the initial IT study, DEHNR management established the Information Resource Management Team (IRMT). Its members include the Assistant Secretary for Administration, the Acting Director of DCS, and representatives from the Divisions of Health, Environment, and Natural Resources. It is chaired by the acting director of DCS. All members of the IRMT have considerable experience in their divisions, understanding many of the business processes and general information requirements of their divisions. Most are also well versed in various aspects of computing. The IRMT has been charged with a review of the white paper recommendations and the development of a more detailed set of proposals. These proposals

address the identification of all essential IT functions, specific organizational assignment of these functions, and development of staffing requirements associated with these functions.

The IRMT has reviewed the white paper, considered issues raised in the white paper and others with staff members and management in the respective divisions, and engaged in a series of discussions. Initially, discussions centered on the strategic direction of the ITM functions. The sense of the team is that a clear understanding of the ITM strategic direction encourages coherent IT decision-making at all levels. Where the direction is clear, IT investments are more likely to complement one another, and decision makers are more likely to consider the impact of their decisions on both their division and the department as a whole.

Next, the IRMT using this new strategic direction identified and reviewed the IT functions that would be essential for well-run, effective ITM operations. During these discussions, the IRMT kept mandates from the state IRMC in mind. The set of functions recognizes that DEHNR ITM must support all facets of the department's information systems needs including mainframe-based production systems, distributed client/server applications, office automation, telecommunications, and decision-support systems. Further, these functions should support all types of information including data, image, and voice.

Once the functions were fleshed out, discussions moved to the organizational assignment of these functions and finally to staffing requirements. Discussions on the assignment of functions were subject to the tension that stems from an effort to keep the IT functions as close to the customer as possible while, at the same time, attempting to integrate IT functions (which is easier if the functions remain highly centralized).

Four IT models were examined. These were:

- Centralized IT Model. Under this approach all IT functions, funding and staffing would be under the control of the centralized agency. This agency would handle both the policy/planning and the service roles of information management.

- Decentralized IT Model. Under this approach, all IT activities would be at the division level. There would be no centralized IT activities, including a policy/planning agency.

- Centralized Planning/Policy Model. Under this approach, there would be centralized planning and policy development only. All other IT services would reside at the division level.

- Coordinated IT Model. Under this approach, there would be centralized planning/policy development, a centralized service bureau for certain services, and selected, delegated IT functions at the division level.

Input was sought and received from IT professionals within and outside the Department and state government. The general consensus from these sources was that under the right conditions each model can work, but they all had some definite risks associated with them. No perfect answer exists.

The IRMT discussions centered on two key criteria: 1) the selected model should be one that best fits the DEHNR business environment, and 2) it should be one that has the best chance of receiving strong senior management support.

With these thoughts in mind, the IRMT recommends the Coordinated IT Model. The IRMT believes that this model has the best opportunity to receive both management and staff support, as it provides an active role for both the centralized information technology services and the scientific or technically-advanced divisions. This model clearly puts IT at the heart of business planning at both the departmental and division levels. Second, it best fits the culture of this department by allowing the scientific application of technology to proceed at the pace of the respective divisions.

Finally, staffing recommendations were developed with help from the State Information Processing Services (SIPS). The IRMT, while conversant in many aspects of ITM, felt it was not sufficiently well-qualified to determine staffing levels and therefore sought outside assistance. SIPS was asked to put together a team of specialists to develop recommendations for IRMT review. IRMT believes that the SIPS team is well suited because SIPS is a contract-based organization and is therefore required to address staffing questions on a regular basis. As a government agency, the SIPS team is sensitive to resource constraints and the nature of decision making in state government. Finally, SIPS supports many of DEHNR's major applications and has provided other IT services. In this role, it has some sensitivity to current conditions in DEHNR. To assist SIPS in their deliberations, the IRMT identified indicators and collected data that would give the SIPS team some sense of DEHNR's demand for IT services (e.g. number of major applications, number of local area networks (LAN)). The IRMT wishes to thank the SIPS team for all their efforts.

The remainder of this report will include: 1) a vision statement with associated principles to establish a context and direction for subsequent recommendations, 2) a discussion of ITM functions with recommendations, 3) a discussion of the organization of ITM functions with staffing recommendations, and 4) a statement of "next steps."

## VISION STATEMENT

Our vision is to establish and maintain an information technology/management (ITM) infrastructure that enables every employee and customer reasonable access to quality information and enhances employee performance. To accomplish this end, DEHNR must establish an ITM environment that is well-integrated, a design or configuration that enables many people to work on different aspects of the larger ITM effort at DEHNR, and achieve an integrated result. To integrate its architecture, the major ITM components-data, applications, technology platforms, ITM functions and the ITM organization-must be internally consistent and well coordinated with one another. Such integration enables all users access to complete, up-to-date information, provides a high level of support, and ensures a secure environment. In addition, the ITM infrastructure must be flexible, fostering timely innovation in DEHNR programs. IT should become increasingly cost effective over time and, perhaps more importantly, it should also enhance the cost-effectiveness of other DEHNR programs.

Making a long term commitment to the vision above can lead to many substantial benefits. Examples include a capacity to:

- Respond rapidly and with high quality to mandates for new, major applications.
- Implement statewide IT initiatives (e.g Smartstream) with little disruption.
- Provide management with timely, easy access to decision support information such that they can ask and answer questions iteratively.
- Provide program staff with easy, authorized access to information that resides in different programs or divisions and provide access to the information highway.
- Via the information highway and Internet provide easy, authorized access to information by the general public.
- Seek and receive help from a single person for such things as software problems, networking, password resets, and computer installations.
- Assemble, update, and access various performance measures.

## GENERAL PRINCIPLES

To achieve this vision and develop and maintain this infrastructure, the IRMT will recommend policies and practices that incorporate the following principles. Costs and benefits associated with various principles will also be spelled out during the following discussions:

### *CUSTOMER SATISFACTION*

The IRMT believes that customer satisfaction is the central principle upon which all other principles and recommendations rest. All forms of information need to be supported and managed to achieve a high degree of customer satisfaction.

ITM organizations exist to enhance the productivity and effectiveness of their customers in the operating divisions and to provide information access to the general public. To this end, ITM organizations must regularly query their customers focusing on the functions that different members of the community are trying to accomplish while anticipating what's possible with changing technology. In addition, IRMT recognizes that many members of the DEHNR community may not be able to readily identify what they need. As such, ITM organizations must also provide assistance and advice on preferred short and long term solutions.

Of course, in any large and multifaceted organization like DEHNR, customer needs are complex. They can overwhelm even the largest, most generously funded ITM organizations, and they may conflict with one another. Such conditions inevitably require the setting of priorities. To assure the highest level of customer satisfaction, the process for setting these priorities must be fair, representative, and bring the highest good to DEHNR as a whole and to its constituents.

Customer satisfaction in all areas must be viewed as one of continual improvement. Thus the evolution of the ITM functions, selection of process methodologies and development strategies, and the training of staff must foster an increasingly satisfied customer. Process indicators that measure customer satisfaction should also be developed and revised over time. These indicators should be measurable, verifiable, and cost effective. They should

be made available to senior management and to the DEHNR community on a regular basis to enhance ITM accountability.

***DECISION SUPPORT***

Indicators will be established and pertinent information gathered and analyzed to support and enhance decision making.

The relevant "business" factors must be included in DEHNR' s data management systems and be readily available to DEHNR management in the fiscal and planning cycles such that managers can effectively evaluate programs and share information with legislators, other funding sources, and external constituents in a timely fashion.

The IRMT emphasizes that an effective decision support function requires partnership between program and ITM staff. It also notes a clear differentiation of roles. Program staff develops its own specific goals/objectives and associated measures. They also collect information on operations and on program services. They determine how this data should be collated, summarized, and analyzed, and they prepare presentations. That they should engage in these decision-support activities stems from their complex understanding of operations, demands placed on their program, resource constraints, the program's relationship to various external constituents, etc. In other words, they understand the questions that must be answered.

At the same time, given their technical expertise, the ITM staff determines how data should be organized, where it should reside, how it can best be accessed, what tools provide the richest, simplest presentational functions, how to disseminate the data electronically, etc. Both teams should be in regular communication with one another as they iteratively develop, maintain, and upgrade programmatic decision support systems.

Clearly as the quality initiative expands, as accountability becomes a more pervasive standard, and as managers require closer control of their operations, decision support systems will become more important and commonplace. The IRMT recognizes this trend and supports a more articulate definition of roles and improved policies, procedures, and organizational forms to enhance IT decision support.

***PROCESS METHODOLOGY***

A life cycle process methodology will be selected and used to ensure that all key components of an Information Technology/ Management system are addressed in any significant development efforts.

As noted in the vision, easy user access to information across the department requires effective integration and coordination. Central to such coordination is the selection and introduction, across departmental divisions and programs, of a common application development and maintenance methodology. This methodology would define the process and techniques used to develop new IT applications and to enhance and maintain existing applications. The methodology should also include such day-to-day functions as creating and maintaining documentation, operating network and production applications services, and maintaining software configurations (e.g. versions and releases).The selection and introduction of a preferred methodology should be a high priority.

In addition, IRMT supports the establishment of policies for application development, enhancement, and maintenance services. These policies will set priorities for projects and criteria for customer services. The policies will also address the roles and responsibilities of operational units and the application development staff during the application development life cycle.

Finally, most methodologies include a decision phase in which one evaluates the option to buy an application as off-the-shelf software instead of developing in-house systems. This is important, since off-the-shelf software can offer viable and cost-effective application solutions.

***TECHNOLOGY SUPPORT***

An information technology support infrastructure must be developed and implemented with adequate resources. A technology support infrastructure must take into account:

- the integrity of the information,
- provide for consistency of collection and use of the information,

- provide for adequate protection of the information and assure confidentiality, and
- provide for continuous availability.

This infrastructure includes teams of experts who identify technological trends, install and maintain networks, assure data integrity, reliably archive old data, assure reliable electronic communications (e.g. E-mail), update systems software, develop and customize applications, provide a clearing house function and help desk, develop and manage service contracts, and provide specialty services for proprietary software and specialty applications like graphics and image processing. (The IRMT believes that hardware support should generally be handled by the divisions and that outsourcing is often the most economical way to provide such support.)

Historically, these many support functions have resided in a computer center as elements of a single hierarchical organization. However, today this model is changing as technologies move from enterprise mainframes to a networked system of distributed computers and data, and as end users become more sophisticated. Centralization is giving way to a set of centers of expertise where coordination is accomplished via standards and policies rather than central control. The IRMT believes that this evolution is a positive one, providing better access by end users to technical experts and a more responsive set of ITM functions.

At the same time, the IRMT raises several points of caution. *First, it stresses that such an organization cannot succeed without consistent and firm support of policies and standards by senior management.* Without such support, islands of automation will quickly emerge as different programs adopt different software, data naming conventions, application development methodologies, etc.

In addition, this shift in the organization of technology support requires a significant change in the funding of these functions. Budgets that have traditionally accrued to a central organization under a single manager now are distributed to the various centers of expertise that may be part of the administrative organization or part of an operational unit. *As this evolution to a more distributed organization occurs, care must be taken to assure adequate*

*funding for the different functions, and such funding may require the reallocation of funds from one organization to another.*

Finally, just as careful coordination is required for funding, the same care must be taken as the various experts coordinate their efforts on joint projects - which will be common place. As policies and procedures are developed for this more distributed environment, procedures must be established to assure consistent, effective team work.

***COMMUNICATIONS***

A communications system that easily disseminates all forms of electronic information, effectively integrates existing communications technologies, and provides a clear evolutionary path for future technologies is essential if DEHNR is to ensure the success of its information technology infrastructure.

This communications system should enable ready electronic information access for all local and remote customers. Such a system is critical for a department like DEHNR which maintains a large number of environmental, health and medical databases, distributes that information widely throughout the Department, and requires information intensive decision making in program areas. Effective communication is essential if we are to reduce response time, make better informed decisions, and better serve our publics.

With this in mind, IRMT believes that the various communications system elements (e.g. LANs, WANs, wiring, communications software, telephony, network administration and user support) should be given high priorities. These technologies should be supported such that all users of this Department's data have department-wide access to information as soon as possible. Our communications goal should enable each office and user to communicate electronically across the department and over the Internet with up-to-date communication technologies (e.g. fax/modems, web browsers, voice response systems, kiosks).

***COMPATIBILITY***

All data must be defined and stored to provide consistent collection and use across computing environments in the department.

As illustrated by the 1991 North Carolina Inventory of Environmental Data Sets and other documents, DEHNR is a complex organization of specialized programs that is rich with data addressing diverse environmental and public health issues. While these programs often rely on their own data, the nature of these issues also requires the sharing and integration of information across programs. Such sharing of information enables decision makers to better anticipate the impact of each program's initiatives on other programs, enhances enforcement with improved access to permitting and compliance records, and improves programmatic and departmental responsiveness.

To this end, the IRMT believes that the DEHNR ITM strategy must include:

- a data administration function that is located centrally and logically organizes program information such that related data from various data sets can be readily secured and accessed by authorized users across the department;

- a data dictionary to define fields of information that are common to different data sets and ensure that users have a common understanding of the data being collected across the department.

To be widely effective, such sharing of resources must be supported by senior management.

***TRAINING***

A knowledgeable workforce is essential for the successful development, implementation, and utilization of all information technology/management systems; therefore, timely and adequate training must be provided.

The IRMT notes that current training budgets are almost nonexistent (DCS's training budget is less than $9,000, and Regional Offices' training budgets are routinely zeroed out). Clearly training is currently considered a low priority during these times of constrained budgets. Yet as noted in a Gartner Group report on government ITM, "Keeping morale high, people motivated and making sure professionals are armed with the right skills are critical for staying on a successful path." The report

observed that information technology is changing exponentially and that significant training is required simply to keep skills current, not to become state-of-the-art. Without an enhanced commitment to training, DEHNR can expect qualified IT professionals to look elsewhere, will see more and more of its ITM functions outsourced which, in turn, creates problems of coordination and continuity, and will lag behind in its selection and adoption of changing technology.

The IRMT supports a substantial increase in funding for computer-related training, with designated line items in the program/division budgets. This funding should provide both internal and external training resources. Internal resources would include such things as classes on DEHNR applications and standards. Internal resources would support training coordination define skill requirements for different IT positions, coordinate IT training in operational divisions, and to assist in budget preparation for training line items. The IRMT also encourages cross training by designated end users. External training would provide IT professionals and sophisticated end users with general information on changing technologies and approaches to computing (e.g. migration from mainframes to distributed platforms) and hands on instruction with specific hardware and software.

The IRMT recognizes that training must be tailored to meet the needs of different IT and end user groups. New employees would require an orientation to the DEHNR ITM environment including instruction in standards and policies. End users require training on standard applications (e.g. spreadsheet, wordprocessors) to better utilize the rich functionality of these applications, and all departmental IT professionals need regular exposure to new technologies and updates on state and departmental rules and procedures. The IRMT recommends that a varied set of instructional resources be provided to meet these different instructional needs. In addition, the IRMT believes that a basic competency for different user groups should be developed, and that program/division management be held accountable for training to assure this competency.

*SHARED RESOURCES*

The IRMT believes that resources used in development, implementation, and life cycle support should be shared intra-departmentally to the greatest extent possible.

Although each program in the Department has significant data collection and access requirements, the resources available to satisfy these requirements vary substantially across programs.

Centralized IT application development resources are limited. In response, some programs currently develop and maintain applications internally or through outside contracts, while others do not have the resources to support such operations. In such a varied environment, the sharing of selected applications could greatly benefit the smaller programs and more generally foster better stewardship of limited resources.

To encourage this sharing of applications, the IRMT advocates:

- A process methodology be selected and enforced for consistent and cost effective project development across the department.
- Provision be made for review of projects to avoid unnecessary or unintended duplication of hardware, applications, etc. and to identify applications that may be shared between divisions or programs. (The IRMT recognizes that some redundancy may be called for to effectively manage data or provide sufficient back up for disaster recovery.)
- A hardware inventory be constructed, regularly updated, and disseminated and proactive programs be established to encourage the sharing of hardware where appropriate.
- Reasonable access to IT project development resources be ensured for all division and programs.
- Consistent support service be provided for all applications used within the department.

*SECURITY*

Security must be provided to safeguard information, preserve integrity of data, control access, and protect the confidentiality of information.

Currently, the security function is fragmented. A centralized function exists to determine information access and authorization for mainframe applications. At the same time, different provisions are made to provide access to different departmental LANs, distributed databases, and distributed applications. As a result, users must remember a number of different passwords. Security administration is cumbersome and time consuming at all levels, and the opportunity for a breech in security is exacerbated.

The IRMT acknowledges these problems and supports the formation of a security review team to assess the current situation in detail and to develop detailed recommendations on security organization and administration. The committee should include divisional representatives, representatives from the central ITM organization, and an expert on security matters, perhaps an outside consultant.

In order to develop recommendations on the reorganization of DEHNR's ITM services, the IRMT first produced a listing of functions that reflects the preceding principles. These functions are typical and necessary in a well-run IT operation. They are discussed below with a cost-benefit rationale for the function, a brief description, and high level recommendations on where the functions should reside. More detailed assignments of these functions will be forthcoming in the organization section.

## STRATEGIC IT PLANNING AND IT MANAGEMENT

***Strategic Information Technology Planning***

Like the more general strategic business planning, strategic IT planning is intended first to clarify the strategic direction of the IT organization and second to effectively anticipate strategic changes in the external environment. These changes may represent opportunities or challenges to the organization. IT planning fosters proactive resource allocation decisions. It promotes important ongoing IT initiatives, leading to a greater likelihood that they will be continued through to completion, and it discourages new, poorly coordinated initiatives. The result of effective IT planning is a well-defined path for future IT investments, more effective integration of major IT functions with corresponding improvements in the exchange of information, a tighter coordination between IT initiatives and strategic programmatic initiatives, and a staff with a more coherent set of responsibilities and a clearer understanding of contributions they make to the organization.

1. ***Institute a centralized, systematic IT strategic planning effort to promote a flexible, integrated IT architecture.***

This function should reside centrally with regular access to senior departmental administrators. It entails the creation and execution of sensitive planning processes that establish formal two-way communication between program and departmental managers and IT managers and staff. It should regularly assess IT operations with performance measures and inventories of IT assets. It should assess the changing environment looking at such things as attitudes about the use of information resources, changing IT skill requirements, changing programmatic directions, and key political issues. Finally, it is responsible for developing a coordinated information architecture, a blueprint of

well-integrated IT functions, that enables timely, effective sharing of information and aligns IT functions with the strategic programmatic direction of the larger department. For the larger divisions, representatives of the central planning function may also work with planners who reside in the division and are closely involved with both IT and the "business" of the division.

*Technology Assessment*

Computer and communications technologies are changing rapidly often with dramatic increases in functionality and with significant increases in systems resource requirements (e.g., CPU processing power, disk storage, RAM). In addition, the vendors' environment has become increasingly competitive with more vendors for any given product. To determine which products best serve one's current and future requirements and to determine which vendor provides the best value are often time-consuming tasks, requiring a perusal of trade magazines, testing of evaluation copies in different computing environments, and a good overall grasp of the general direction (e.g., which operating systems will be dominant in the future) that computing and communications technologies are taking.

Clearly end users must be involved in the choice of computing technologies since they are intimately associated with the business or technical requirements the computing technologies are intended to address. At the same time, most users don't have the time and many don't have the computing or communications expertise to assess alternative computing technologies effectively.

In addition, in order to encourage easy sharing of information across the department and to narrow the support demands placed on central computing services, a selected set of general purpose hardware and software should be identified and promoted for departmental use.

2. ***Establish central technology assessment function to evaluate changing technologies and recommend preferred IT investments.***

Given the end users need to select powerful technologies that position them well for the future and the department's need to narrow the range of supported technologies, a central function that is dedicated to identifying preferred technologies is recommended. This function would develop and maintain an inventory of existing technologies in the department. This inventory would be used to better identify program and user

candidates for upgrades and to better ascertain upgrade paths. It would review trade literature, requesting evaluation files and testing them. It would purchase and test promising hardware and software. The function would develop recommendations for general purpose and more specific technologies (e.g., imaging solutions) and disseminate this information to management and to the larger department. It would also provide specific consulting support for end users who request it. Finally this function would work with technically sophisticated end users to understand technologies that they have evaluated and adopted (e.g., GIS applications) and disseminate this information to other departmental organizations that might have an interest in these developments.

Technology Assessment policy refers to the establishment of hardware and software standards and should be located centrally. Technology Assessment is also located in the divisions and refers to the selection of specialized software for programmatic needs.

***IT Management***

The need for effective management is pretty much self-evident, and for the most part, IT management is like management in any organization. It identifies program objectives, marshals resources, controls operations, and acts as a representative/advocate of its organization. As a result we will not discuss it here except to say that for the most part, it will be subsumed as part of other IT functions (e.g., data administration, security) and will therefore reside either centrally or in the divisions as related functions do. A central management function will also coordinate the activities of the different IT functions.

***Establishing and Enforcing IT Standards, Policies, and Procedures***

As noted in the introduction, IT services have expanded dramatically as computing power has moved to the desktop and as end users have become increasingly sophisticated. Unfortunately, the proliferation of distributed systems (i.e. distributed computers, data, and applications) has also led to a dramatic increase in the barriers to shared information. With centralized, mainframe computing and IT functions,

organizational standards were set de facto. With the advent of distributed systems, these de facto standards quickly disappeared. Different divisions now use different productivity software (e.g., wordprocessors, spreadsheets). They write specialized applications in different languages using different development methodologies. The "same" data is defined differently in different databases both within and across divisions. A DEHNR staff member may require several different passwords to access different applications and LAN's, and so forth. The key benefit of distributed systems is more immediate and powerful access to information by the end user. The drawback is that the accessible information is often highly circumscribed.

3. ***Institute standards, policies and procedures for information access, IT personnel, office automation, systems development, and networking.***

To address this problem and enable wide ranging access to information, the IRMT believes that department wide standards, policies, and procedures should be established and enforced. These standards should address such things as information access and dissemination (e.g. information confidentiality, security, forms design and control, reproduction, and retention); office automation systems (e.g., telephone, E-mail, PIMs, workstations); IT policies that apply to all IT personnel and activities across organizational boundaries (e.g., training); systems development methodology (e.g., documentation standards, procedures to evaluate user requirements, programming guidelines and languages); data administration (e.g., file and directory naming conventions, coordination of database administrator with application developers, auditability); and networking (e.g., wiring, packet protocols, topology).

The IRMT believes that a process for setting and enforcing standards should be undertaken. It should include high level representation from the department's divisions; it should be fully supported by senior DEHNR management; it should include a formal feedback loop to assure regular evaluations of the impact of standards; and it should enable an iterative introduction and refinement of standards over time. The standards setting and enforcement function should be centrally located and it should include staffing to regularly audit and report compliance with standards and information policy. It should also work closely with security, data administrators, and network administrators developing standards in those areas.

## DATABASE/INFORMATION MANAGEMENT

*Data Administration*

At the center of the efforts to provide timely access to information is the management of data. As the workstations/servers and their storage devices have proliferated so have associated data sets. In many instances these data sets are extracts from other data sets on other machines, and as these extracts proliferate so do problems of concurrence and consistency. Which data set is the official set? Why do reports that should use the same data show different figures? Further, end users are often interested in pulling data from a number of data sets that reside in different locations. Unfortunately, the same data element may be named differently in different data sets. Data with the same name may be defined differently. In the end, the end user may not be able to use the data or must go through time consuming translation and error checking. Finally, inventories of departmental data sets (and the data they contain) are not created, updated, and widely available. As a result, end users must rely on ad hoc detective work to identify possible data resources. These problems and others are inherent in a distributed environment where a central data administration/coordination function is not present.

*4. Introduce a data administration function to promote consistent departmental data management.*

To address these problems, the IRMT recommends that a data administration function be established that has responsibility for: 1) as part of the standards and policy process, establishing and enforcing data related standards; 2) resolving questions of data ownership; 3) building departmental data models; 4) creating and managing metadata in a departmental repository; and 5) developing a corporate data base. (The IRMT recommends that those program areas that generate the primary data continue to be responsible for data maintenance and updates and that data in the corporate database be derivative of this programmatic data.) The objective of this function is to regularize the management of departmental data across divisions. As such the function should be one of the centrally provided services.

*Disaster Recovery*

Although the likelihood that a disaster recovery plan will ever be needed is very small, the potential losses in the event of a disaster would be enormous. Although most of DEHNR's mainframe applications are supported by a SIPS disaster recovery plan, considerable mission critical data resides on file servers throughout the department. In many cases this data is not regularly backed up and few systematic disaster recovery plans are in place.

*5. Adopt departmental disaster recovery policies, develop division specific plans and implement them.*

For this reason, IRMT recommends the adoption of disaster recovery plans with the necessary commitment of resources. In general, this plan should include an identification of critical applications, the files and programs associated with these applications, individuals who comprise the recovery team with designated responsibilities, and backup computing sites. It should also make provisions for various test opportunities. The disaster recovery function would develop and update this plan, assure that team members would be adequately prepared, and run periodic tests.

Divisions will be responsible for the development of recovery plans for their applications subject to departmental policy, and LAN administrators would be responsible for establishing recovery teams and procedures at their sites.

*Security*

Although electronic information has always required provisions to prevent loss, corruption, or unintended use, advances in networking and computer software have magnified the vulnerability of electronic information. Via networking individual workstations and information systems can communicate with one another regardless of physical location, consequently, unauthorized access can occur from any location on the network which often includes workstations on the Internet. Online access, as opposed to batch processing, allows users to gain easier access to data files and enhances their ability to manipulate data. In addition, more complex and varied configurations of hardware, software, organizations, and people associated with these networks create new venues for access. For example, wireless networks may be penetrated via frequency

scans. As expected, these changes have fostered increased system penetration by hackers and other unauthorized users and introduced a new threat to electronic information integrity the computer virus.

*6. Establish a central security function to establish/coordinate policy and controls that authorize, monitor, and sanction access to hardware, applications, data, and networks.*

To address these threats to data integrity, the IRMT recommends that a comprehensive security function be included as part of the IT organization. This function would introduce and maintain policies, procedures, and technical measures to discourage unauthorized data and system access where appropriate. This function would work closely with the representatives of the general standards and policy function. It would also balance the requirements for security with those for information access.

The IRMT believes that the security function should coordinate and manage a series of controls: 1) hardware - assures that hardware is physically secure from unauthorized access, power surges, and exposure to extreme temperatures and humidity; 2) software - monitors and prevents unauthorized access to program applications, third party software, and systems software; 3) computer operations - ensures that procedures for the storage and processing of data are consistently and faithfully followed; and 4) data - ensures data throughout DEHNR's distributed system is safe from unauthorized access, corruption, or loss.

The development, monitoring, and enforcement of departmental security policy would be a centralized ITM function. The implementation of security practices subject to this policy would be undertaken by the Division of Information Technology Services (ITS) (formerly DCS) services.

## INFORMATION CENTER

*Information Center*

DEHNR, like most service organizations, is peopled primarily by information and knowledge workers. Their activities revolve around the creation, processing, and dissemination of information. For the most part, these workers rely on computing to execute their tasks.

With the proliferation of powerful desktop computers and third party software (e.g. wordprocessors, spreadsheets), end users have become an increasingly important part of IT in the department. In fact, investments in end user technologies often exceed those for IT professionals by a factor of three or four.

However, the use of these technologies is uneven. Some users are expert, fully benefiting from the rich features and power of their end user technologies. Many other users have only a superficial understanding of the technologies they commonly use and little or no knowledge of other, potentially helpful technologies.

*7. Form an Information Center with the following functions: 1) software contract administration 2) help desk, and 3) training.*

Given the central role of these technologies in the "business" of the department, the substantial investment made by the department in these technologies, and the uneven benefits that derive from them, the IRMT recommends that a formal information center function be included as a central feature of DEHNR's IT architecture.

*7a. Software contract administration should purchase licenses, distribute software, and handle billing.*

The information center function includes several essential activities - **software contract administration,** a **help desk,** and **training**. **Software contract administration** refers to the purchase of software licenses and the distribution of software with documentation throughout the department. The information center would be a single point of contact for the Division of General Services (DGS), vendors, and end users. It would work with DGS to select and purchase technologies, be the departmental point of contact and contract administration for vendors, and provide copies of software and distribute billing to users.

*7b. Help desk should be the central software consultant and should be a clearinghouse for IT specialists.*

The **help desk** would consult with users on the installation and use of third party software. It would work with the general standards and technology assessment functions to identify, evaluate, and select supported third party software. It would inventory problems, develop solutions, and disseminate these solutions, product information, and other IT related information to end users (e.g. newsletter). It would also act as a clearinghouse to provide users with contacts to IT specialists

(internal and external) on such things as program applications, hardware, networking, and telephony. Finally, it would perform various "housekeeping" functions for the department.

*7c. Training center should provide department specific training and coordinates training with external vendors.*

**Training** is the final, critical set of information center activities. The information center would both provide training directly and would work with Human Resources to identify, select, and regularly evaluate training by external vendors. Central and divisional IT professionals and end users would be trained directly on such things as departmental IT policies and standards and the departmental system development life cycle methodology (SDLC). It would outsource training on third party products, job-related training for IT professionals, and high level education to senior managers on strategic IT issues and trends.

The information center support function would be centrally located. The training function would work with Human Resources to outsource training to external vendors for widely used third party software like spreadsheets and wordprocessors. However, training for program-related applications would reside in the divisions subject to departmental policy.

## DEVELOPING, MAINTAINING, AND ENHANCING APPLICATION SYSTEMS

***Developing, Maintaining, and Enhancing Application Systems***

The existing DEHNR applications environment is large and complex. DEHNR has roughly one hundred legacy applications which currently reside on the SIPS ES9000 mainframe. Of these, about seventy are associated with environmental programs; twenty-five support health programs, and the remainder provide support for natural resources and administrative functions. At the same time, demand for new systems is very high in response to legislation and efforts to streamline operations. The collective demands for new, high quality systems and the need to maintain existing systems overwhelm existing departmental applications development resources. In addition, the state IRMC has established guidelines for applications development which must be incorporated in any applications development proposals.

***8. Restructure existing applications development services and provide significant additional departmental funding.***

The IRMT recognizes the frustration of both end users and application development professionals in the current, resource constrained environment and therefore recommends a significant restructuring of the applications development function along with a significant infusion of additional funding. In line with this recommendation, the IRMT advocates the development of a formula that correlates increased demands for application support with additional staffing. Finally, the IRMT recommends that the divisions requesting proprietary applications have budgetary responsibility not only for the initial development but also for ongoing maintenance of the application.

***8a. Divisions wishing to develop their own applications must adhere to departmental policies and procedures and adequately support these applications over their life cycle.***

Some of the larger divisions will develop their own applications. For those divisions who wish to establish their own applications development function, the IRMT recommends the policy and planning oversight team in conjunction the with quality assurance function first determine the division's ability to create and manage a high quality operation. The division would not be allowed to initiate an applications development and support function without adequate commitment and resources.

***8b. Support end users in developing their own applications subject to departmental standards.***

Finally, technically sophisticated end users (who are commonplace in DEHNR) should be encouraged to develop their own small-scale, circumscribed applications subject to departmental guidelines and standards. The IRMT therefore recommends that the information center include training on supported fourth generation software tools and on development guidelines for end users. It would also maintain an inventory of end user applications and provide consulting support on system integration (i.e. using different third party software in an integrated fashion to accomplish a series of related tasks).

***Project Management***

***9. Establish a central pool of project managers to oversee the development of departmental/division applications.***

In response to IRMC mandates, a team of well-trained project managers should be established. Members of this team would manage cross divisional applications and would be made available to divisions to oversee the development of high-priority, division specific applications. Project managers would work closely with systems analysts to determine the merits, feasibility, and user requirements of a proposed project; identify requisite staffing and technology resources; manage project personnel, monitor

adherence to the standard development methodologies; establish time lines; and regularly communicate progress to appropriate individuals.

*Quality Assurance*

***10. Introduce a quality assurance function to periodically monitor applications development projects and assure sound practices.***

The IRMT recommends the establishment of a formal quality assurance (QA) function. This function may be contracted with SIPS or some other external vendor to assure no conflict of interest. The key objective of this function is to ensure that development projects include provisions to assure high quality applications, applications that meets user requirements, and are as error-free as possible. Such provisions include selection of a rigorous development methodology, introduction of guidelines based on past development experiences, periodic application tests by QA members, and the construction and collection of software quality metrics. Finally, the QA function should work with the training function to develop training materials for developers.

The Project Management and QA functions would reside centrally while providing support for applications developed centrally or in the divisions. Application development specialists would reside centrally to develop applications in the smaller divisions or across divisions and in the larger divisions to develop their own applications. The IRMT recommends that project managers and QA specialists be budgeted as part of a central IT organization.

*Systems Development Life Cycle Methodology (SDLC)*

***11. Adopt Method I as the departmental SDLC.***

Finally, the IRMT recommends the adoption and customization of Anderson's Method I to be used by application developers throughout the department for all major systems development. In part, the IRMT proposes this recommendation because it is the state government standard. As such it is supported by SIPS and is free to the department. In addition, it is a well-recognized and widely used methodology that can readily be adapted to the DEHNR environment. (The IRMT also recognizes the value of a prototyping methodology for smaller projects where user requirements are difficult to define.)

In general, an SDLC is a formal method of applications development that partitions the development process into discrete, often sequential stages and clearly distinguishes the roles of the IT specialists and the end users. (Generic stages include: project definition, systems study, design specification, programming

specification, performance testing, and post implementation audits.) Such a methodology has been mandated by the IRMC to foster consistent, high quality applications development.

## TELECOMMUNICATIONS

***Telephony and WAN support***

***12. A central telephony consulting function should be continued.***

Installation and upkeep of existing telephone and long distance data services is currently handled by SIPS. The IRMT believes that DEHNR divisions should continue to contract with SIPS for these services. A single position currently exists in the central DEHNR computing group to assist divisions in the mapping/planning of prospective telephone systems and the upgrade of existing systems. It also provides troubleshooting and acts as a liaison with SIPS. The IRMT recommends that this function be continued and that it remain centrally located.

***LAN Administration***

DEHNR is a geographically dispersed organization. It is information intensive with substantial needs to transmit data (of all types) from one organization to another within DEHNR and to other external organizations and individuals. DEHNR has begun to address its data transmission needs with the introduction and interconnection of LANs. At present there are roughly 20 LANS connecting 700 workstations. An additional 1300 stand alone computers have yet to be connected. (The IRMT notes that most of the current installations are ad hoc initiatives undertaken by DEHNR operating units. As a result some units that should have a high priority for networking from a departmental perspective are probably not currently networked.)

The IRMT recognizes a number of important issues associated with the maintenance of existing networks and the installation of additional networks. As examples, LAN administrators vary in their skill levels, in a number of cases resulting in poor LAN support (e.g., poorly designed directories and file naming conventions, limited performance monitoring). A substantial support infrastructure is necessary to manage assets, troubleshoot problems, and receive requests for network connectivity. Network security appears inadequate, and finally, network applications portfolios (e.g., e-mail, bulletin boards, calendars, online

telephone directories) vary significantly, with many LANs having only E-mail.

***13. Establish a senior, central LAN administration function to address the connectivity needs of senior administration and provide support for division and regional LAN administrators.***

To address these and other problems, the IRMT recommends that a senior LAN administration function be established. This function would provide network planning, design, implementation, operation and management support for LAN administrators in the divisions and regional offices. It would work with the general standards function to develop standard LAN policy and procedures for the department, be the point of contact for SIPS and the IRMC, and develop curricula and competency tests with the training function to assure adequate LAN administration skills throughout the department.

## HARDWARE SUPPORT

***Hardware Support***

***14. Hardware support should be outsourced.***

The IRMT recommends that all hardware maintenance and repair be outsourced. The central computing group would coordinate outsourcing for the administrative division. LAN administrators would coordinate outsourcing for their units and stand alone machines would be outsourced by appropriate operational management. All units requesting service would pay for the service.

DEHNR's ITM functions can be thought of as three related, but distinct sets of activities. The first set of activities provides high level policy and operations oversight, strategic planning, and development and enforcement of specific departmental IT policies and procedures. The second provides departmental ITM services, and the final set are planning, operations, and services provided for individual divisions by those divisions. (See organization chart on the following page.) The assignment of ITM functions to these functional areas is discussed in the following section.

## HIGH LEVEL ITM OVERSIGHT

*15. Formation of the Information Resources Management Board*

High level oversight resides with the Information Resources Management Board (IRMB). This body is equivalent to the current IRMT; however, it is a standing committee. The IRMB would be composed of:

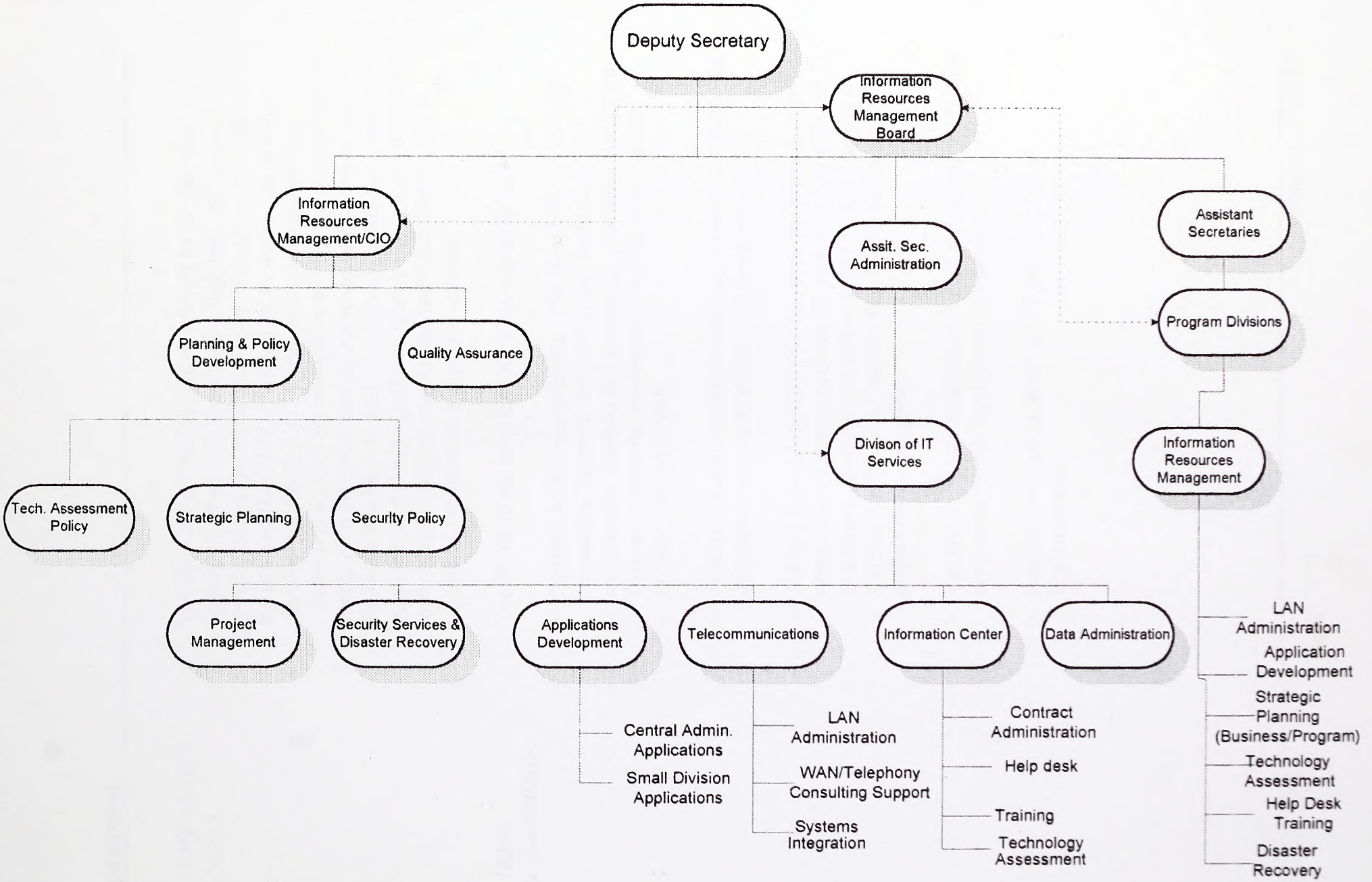
*15a. Composition of IRMB*

- Two representatives from the Division Director/Deputy Division Director level
- Two section chiefs
- Two at large members (preferably members below the section chief level)
- One member of senior management
- Two members who are outside of the department and are users of the department's data or information systems
- Two field representatives

*15b. IRMB membership tenure*

The Chief Information Officer would staff the IRMB (see below). Members will rotate, on the average, every year. To assure continuity, the IRMT recommends that of the initial members, four rotate off after six months, four rotate after a year, and the remainder rotate after a year and a half. Subsequent participants would serve for one year. Members may be reappointed for another year and will be required to attend an annual retreat for updates on changing technologies and IT issues.

# ITM FUNCTIONS and ORGANIZATION CHART



***15c. IRMB Member selection***

Members of the IRMB would be selected by the Secretary and Deputy Secretary with the intention that these appointments provide fair representation across the department. The IRMT stresses *that the IRMB is responsible for setting the strategic direction for DEHNR's ITM, for reviewing and enforcing standards and policy recommendations, for setting major systems applications priorities, and for approving departmental and divisional IT plans.* As such, it is very important that senior management make thoughtful assignments to this committee, and they recognize that committee responsibilities *will require a significant commitment of time and attention.*

***15d. IRMB Responsibilities***

The IRMB would have the following responsibilities:

- Strategic technology planning. The Board will review and recommend approval to the Secretary the biennial departmental business and technology plan submitted by the CIO, and ensure the development of such plans in each division within DEHNR.
- Monitor a quality assurance program, review and approve the department's customized life cycle methodology.
- Act as a board of appeal 1) for divisions/programs that are deemed out of compliance with IT policies by the CIO and 2) to arbitrate disagreements between the CIO and Director of DITS on significant IT matters. Can choose to review or decline review of appeal.
- Facilitate/coordinate the application of technology to division-level research and development initiatives.
- Reserves the right to review all IT projects prior to implementation.

*15e. IRMB Authority*

The IRMT recommends the IRMB have both a regulatory and advisory role. To discourage bottlenecks, the Secretary's senior staff would delegate decision making authority to the IRMB on most ITM related issues. For large project proposals and for controversial policies, the IRMB will present recommendations to the senior staff for their consideration.

Further discussions should be held between the Chief Information Officer and senior management to determine specific thresholds. Representatives on the IRMB who have an apparent conflict of interest regarding IRMB decisions may participate in related discussions but would not be a voting member.

## PLANNING AND POLICY DEVELOPMENT

*16. Create a senior position, Chief Information Officer, to provide IT direction for DEHNR.*

To promote a systematic approach to planning and policy development the IRMT recommends that a senior position be established, the Chief Information Officer (CIO). This position would report directly to the Deputy Secretary and would be the chief spokesperson for information technology in DEHNR. Essentially this position is responsible for developing an integrated IT environment in DEHNR, an environment that fosters rapid, easy access to information and enables rapid response to external demands.

This position will be responsible for developing policies and standards for the department subject to approval of the IRMB. It will monitor compliance and will impose sanctions for violations. It will develop the department's IT biennial plan. This position will carefully coordinate IT initiatives and support with divisional business objectives. It will review major project proposals for adherence to departmental IT policy, and through the project management and quality assurance functions, assure high quality application development. On day-to-day matters where the CIO and the Director of DITS (see below) are in disagreement, the CIO will have final authority. The IRMB will determine the "day-to-day" threshold policy. Disagreements about significant issues will be adjudicated by the IRMB.

*The CIO's leadership and place in senior management recognizes the absolutely critical requirement for consistent senior management support for the development and enforcement of policies and standards.* The position should be created immediately.

***17. Establish an Office of Information Resources Management responsible for planning and policy development.***

In addition, a new Office of Information Resources Management (OIRM) would be established and would be directed by the CIO. In general, this office would oversee all planning and policy development and would assure high quality applications development and IT service across the department.

The functions included in this office would be:

- Technology assessment policy
- Strategic planning
- Security policy
- Quality Assurance

This structural change is in line with the SIPS/IRMC delineation at the state level and signals the separation of the somewhat ambiguous service and policy/planning roles that DCS has played in the past. It acknowledges that the skills needed for planning and policy development are different from those in an IT shop. The IRMT believes this structural change is crucial if DEHNR is to improve the linkage between priority departmental management objectives and the functions of technology planning and systems development.

**DEPARTMENTAL IT SERVICES**

***18. DCS will be reconstituted as the Division of IT Services, will continue to report to the Assistant Secretary, and will be strictly a service organization.***

The IRMT recommends that the Division of Computer Systems be reconstituted as the Division of IT Services, that it continue to report to the Assistant Secretary for Administration, and that it act only as a service organization for the divisions of the department. This central services function is necessary to provide cross divisional functions, like data administration, to act as a technically proficient single point of contact for vendors, SIPS, and the IRMC, to play a key role in the implementation of departmental policies and standards, and to provide support services for small divisions which can not afford their own ITM functions. IT Services shall house the following functions:

- Data administration.
- Information Center functions including training, help desk and third party software support.
- Application development services including application development for DEHNR administrative systems (budget, personnel, claims processing, purchasing, etc) and smaller divisions, and a service bureau to assist in contracting services for smaller divisions.
- Security and Disaster Recovery Services (e.g. password administration).
- Telecommunications, including telephony consulting support, WAN consulting support and central LAN administration.
- Project Management.

The IRMT notes that DCS provides some of these services currently with the bulk of existing resources going to the development and maintenance of existing applications. However for several of these services only limited, sometimes ad hoc support is provided (i.e. help desk, third party software support, security services), and other services are not provided at all (i.e. training and data administration). Indeed for those functions that absorb the bulk of existing DCS resources, the current demand for services far outstrips the services that can be provided. Thus even in its paired down role as a service provider only, *IT Services will require a substantial infusion of funds for staff and computing*

*technology*. Staffing and other resource requirements are detailed in the next section.

## DIVISIONAL SERVICES

***19. Certain complementary ITM functions should be performed in all divisions that have significant IT needs.***

Throughout its discussions, the IRMT has recognized the basic tension between a well integrated set of ITM functions that is most easily (and often most effectively) realized in a centralized IT organization and the need to keep IT functions as close to the users as possible. This tension is particularly strong in a large, complex organization like DEHNR where programs are diverse and dynamic and much of the staff is technically sophisticated. With this tension in mind, the IRMT has already recommended that a number of ITM functions and related services be centrally located to encourage effective, non-redundant integration of ITM functions. In this section, the IRMT notes functions and related services that should or *could* reside in the divisions.

As noted in the ITM functions section, certain ITM functions should be performed in all divisions that have significant IT needs. The specific execution of these functions should complement the IT work being done centrally. In particular, divisional technology assessment should focus on specialty productivity software (e.g. environmental modeling) that pertains to the division's work. This work and experience should then be made known to the central technology assessment group who can then disseminate it to other divisions who have similar interests. Help Desk and training support should address user needs with regard to divisional applications. Strategic planning refers to strategic issues facing the division and includes strategic initiatives that would be implemented in the division, and the disaster recovery function should develop recovery plans for technologies located in the division. (All of these functions would be subject to departmental policies, and where appropriate, IRMB approval.)

***20. Divisions wishing to establish their own LAN administration and applications development functions can do so subject to approval by the IRMB.***

In addition, the IRMT devoted substantial discussion to the proper location of the LAN management and application development functions. Centralizing all of these services, some of these services, or none of these services were the options examined. In the end, it was decided that certain services associated with these functions would reside centrally. (See above.) Others *could* reside in the divisions. *The critical factor is whether the division has the commitment and resources necessary to provide high quality services for these functions.* It is therefore recommended that a process be established through which the Assistant Secretaries can request delegated authority on behalf of one or more of their divisions for either LAN management, application development, or both. In general, the initial approval and ongoing retention of this authority would be based on demonstrated compliance to appropriate IT standards and policies, and the provision of adequate resources for the defined tasks (both staff size and training). The specific criteria for this delegation should be approved by the DEHNR IRMB.

The IRMT believes that with appropriate adherence to departmental policy, a division can establish LAN and applications development functions that will encourage ease of authorized access to information, ready communications, and increased staff productivity. *As such, the IRMT invites divisions with adequate resources to acquire these functions. At the same time, should a division fail to comply with designated policies and standards, the IRMB has the authority to move the function and associated resources to DITS.*

## PROPOSED STAFFING LEVELS

***21. OIRM requires the CIO, three high level policy/planning professionals, three quality assurance experts, and two support staff.***

Staff for the OIRM must be seasoned professionals who can envision the IT needs of the entire department, demonstrate initiative yet are strong team players, and have strong interpersonal skills. Policy/planning staff should have an appreciation of all general ITM functions. Three members should have expertise in quality assurance, and one should have a strong data administration background. The office should be staffed by one clerical assistant. Initial setup may require hiring several contractors. Assignments and recommended salary levels are included in the table below. New positions are shaded.

| Office/Position | Number | Levels |
|---|---|---|
| **Information Resources Management Office** | | |
| Chief Information Officer | 1 | Level 84 |
| Quality Assurance | 3 | Level 80 |
| Data Administration (data sharing) | 1 | Level 80 |
| General Policy and Planning | 2 | Level 80 |
| Administrative Assistant | 1 | Level 61 |
| Clerical Support | 1 | Level 57 |

***22. The current Division of Computer Services should be reconstituted as the Division of IT Services.***

As noted earlier, the Division of IT Services should be solely a service provider. Further, the services provided should extend well beyond those of the current DCS. In the table below are a listing of recommended positions and salary levels that are considered necessary to provide the functions to support an organization as large and complex as DEHNR.

Security services includes the security of both hardware and computing facilities and of other IT specific areas (e.g. data, networks). The IRMT recommends that two positions be dedicated to the provision of security. One would reside in ITS and would manage IT specific issues. The other would be in DGS and handle security issues related to hardware and facilities and other facilities related issues. A new position would probably be required, given the current level of customer demand.

Data administration and applications development services are driven by the demand for applications. Currently, a very large pent up demand for applications exists, and as divisions continue to evolve from a mainframe to a distributed environment, future demand can be expected to accelerate. Therefore the IRMT believes that the current level of staffing for applications development must increase and that a minimum of five database administrators (DBA) will be required. These staffing recommendations would respond to demand for only the highest priority applications.

The LAN administration staffing recommendations rely on the widely held rule of thumb that one central LAN administrator should provide service for every one hundred nodes. This recommended staffing recognizes there are roughly 700 nodes currently scattered on LANs throughout DEHNR. It does not acknowledge that another 1300 stand alone machines exist, and many of these should also be networked. Thus the recommendation is a bare minimum, with the anticipated demand. The systems integration positions acknowledge the rapid changes in computing platforms and in third party software. Today specialized applications can be developed by "integrating" software and their computing environments. The skill set necessary to do this is, however, very different from that of conventional applications developers. Systems integrators require detailed knowledge of third party software and operating systems as well as programming skills. They must also be innovative with personal initiative.

Currently, DCS has a single position dedicated to WAN/telephony support. It is reported that a considerable backlog exists for consulting services provided by this department. The IRMT is convinced that an additional position would be fully used and therefore recommends that an additional position be added.

Information Center staffing including training coordinators, help desk, contract administration, project management, and technology assessment personnel has been determined based on the experience of SIPS administrators. Their work load was compared to estimated demand at DEHNR. Based on these comparisons with their current staffing in mind, staffing levels were developed.

Finally, ITS activities and personnel are of sufficient size to merit some administrative support. One staff member would be dedicated to budget and office management, and one would be a receptionist and typist.

Existing DCS positions may satisfy a number of the requirements listed below. New positions are shaded.

| Division/Position | Number | Levels |
|---|---|---|
| **Division of Information Technology Services (ITS)** | | |
| Director, ITS | 1 | Level 82 |
| IT Security/Disaster Recovery Services | 2 *(1 of 2 new)* | Level 78 |
| (Hardware, Facilities Security) | 1 | (Is absorbed as part of General Services.) Level 70 |
| Senior Database Administrators | 2 *(1 of 2 new)* | Level 80 |
| Staff Database Administrators | 3 *(2 of 3 new)* | Level 78 |
| Data Entry Clerk | 1 | Level 59 |
| WAN/Telephony Consultant-Senior | 1 | Level 78 |
| WAN/Telephony Consultant | 1 | Level 74 |
| Systems Integration Specialists | 2 *(1 of 2 new)* | Level 80 |
| Lead LAN Administrator | 1 | Level 80 |
| LAN Coordinator/Troubleshooters | 2 *(1 of 2 new)* | Level 78 |
| LAN Administrators-Archdale | 3 *(1 of 3 new)* | Level 76 |
| LAN Administrators-Reg. Offices | 7 | Level 76 |
| Applications Development Manager | 1 | Level 81 |
| Team Leaders | 4 | Level 80 |
| Systems Analysts | 2 *(1 of 2 new)* | Level 78 |
| Systems Analysts | 3 | Level 76 |
| Programmer/Analysts | 6 *(5 of 6 new)* | Level 74 |
| Programmer/Analysts | 4 | Level 72 |
| Technical Writers | 2 | Level 68 |
| Clerical Support | 1 | Level 59 |

| Division/Position | Number | Levels |
|---|---|---|
| **Division of Information Technology Services (ITS)** | | |
| Training Coordinator/Curriculum Development | 2 | Level 74 for coordinator and level 70 for the assist. Coordinator |
| Contract Administrator | 1 | Level 74 |
| Contract Admin. Support | 2 | Level 72 |
| Help Desk Manager | 1 | Level 78 |
| Help Desk Staff | 8 | Level 72 for manager, level 67 for staff. |
| Project Management | *5 (3 of 5 new)* | Level 80 |
| Technology Assessment | 1 | Level 78 |
| Administrative Assistant | 1 | Level 61 |
| Clerical Support | 1 | Level 57 |

Although these centrally assigned staffing recommendations are intended to assist many divisions in their IT activities, staffing specifically for divisional IT offices has not been determined. The IRMT believes that division management should determine their own staffing requirements subject to departmental guidelines. As a result, it is important these guidelines be developed as soon as possible to enable the delegation of IT functions to divisions.

***Significant Budgetary Items***

Implementation of a number of these functions will require some additional IT investments beyond those associated with staff. (Estimated costs are included to help in budget deliberations.) Most noteworthy are the following:

- A server and database manager to house various departmental applications and the departmental data dictionary and data warehouse. ( $20,000)
- A funding pool for LAN installation by divisions with lesser funding; a pool that enables a phased introduction of LANs throughout the department is recommended. ($3000/seat for LAN support and connectivity, doesn't include the computer)
- Training funds for IT professionals and for end users. ($70/end user for instruction on office automation software: 2.4% of IT budget for IT professionals as estimated by the Gardner Group)
- Computers and software for new staff members. ($2300/desktop computer; $400/end user office automation software; $3200/ applications developer database/programming software; $2800/help desk software; $5000/data administrator database software)
- Some facilities renovation, wiring, and furnishings. ($200/wiring per drop; $1000/furnishing per new employee)

*Next Steps*

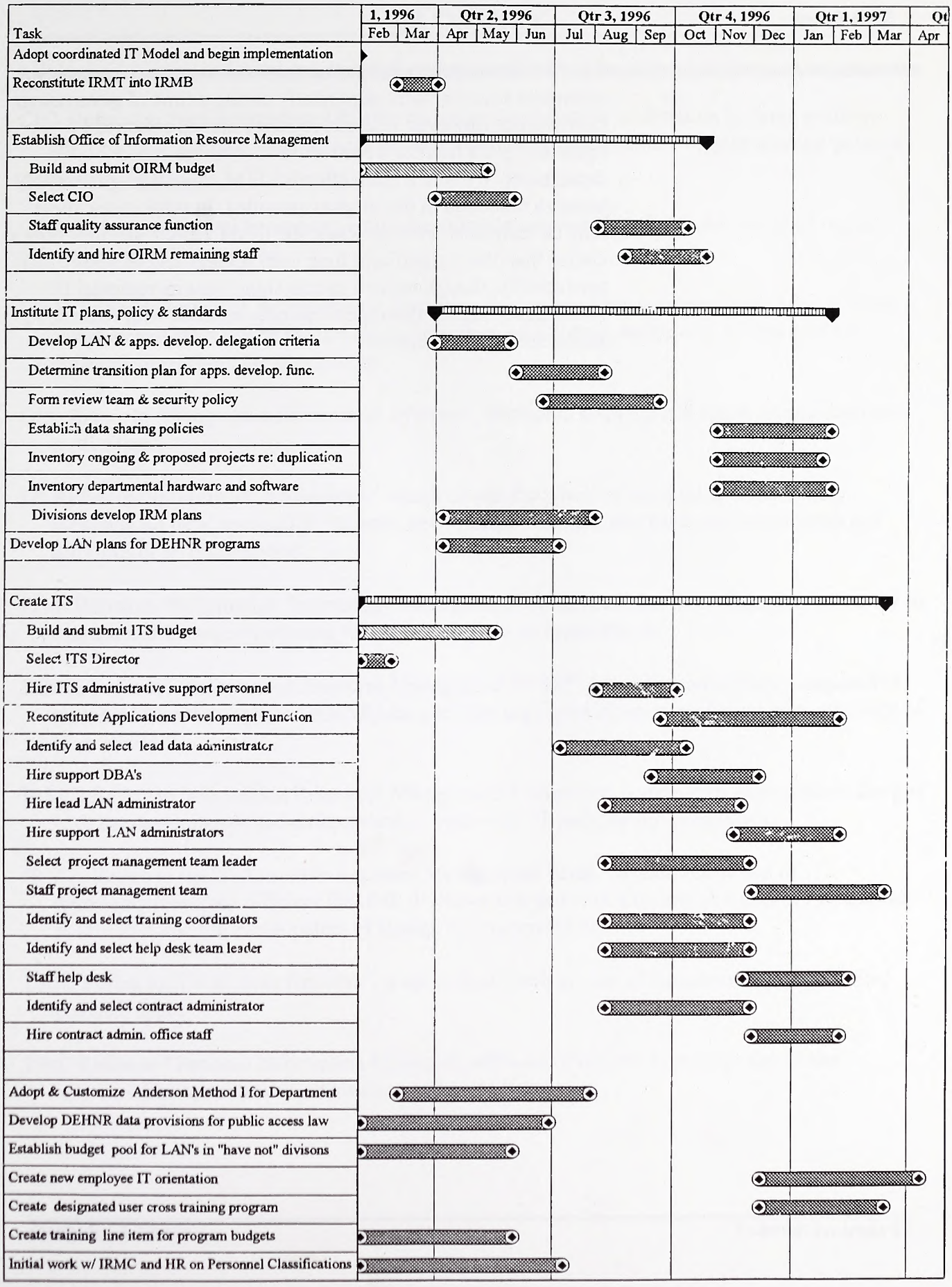
Below is a GANTT chart that lists actions associated with the recommendations in earlier sections. The time lines are aggressive reflecting the interest of senior management. A number of the proposed actions will require immediate and sustained action.

The key, most immediate action is to adopt a coordinated IT model and in so doing, reconstitute the existing IRMT and the Division of Computer Systems and establish an Office of Information Resource Management. Importantly, these actions can occur only with a significant infusion of resources and with clear, continuous support from senior management.

A second set of activities that should be initiated as soon as possible include, the development of criteria to evaluate the formation of division-based LAN and application development functions, creating a sensitive plan for reconstituting the existing applications development function, adopting and customizing an SDLC, and the development of a data dictionary in response to public access law. These activities either must anticipate other more intermediate term and longer term initiatives or they are subject to a tight, mandated deadline.

The remainder of the activities require budget requests and approvals and/or various staff hirings. As such, most can not be undertaken until the beginning of the next fiscal year.

# IRMT Proposed Time Line



*Conclusion*

The IRMT recognizes that the recommendations laid out in this document are ambitious, particularly during a time of government downsizing. However, it also recognizes that an effective IT operation is the heart of a productive knowledge based department. Without a more effective ITM, downsizing inevitably means a reduction in the services provided. In some cases, these may be mandated services. Thus, the IRMT has chosen to follow a course that offers significant long term savings and increased staff productivity, though today it means significant incremental IT investments. Again, this model can only succeed with consistent, strong senior level support.

# GLOSSARY

CIO: Refers to Chief Information Officer, the senior management information systems position charged with strategic planning and the development and enforcement of departmental policies and standards.

CPU: Refers to "Central Processing Unit", the microprocessing chip that is the source of central processing in a computer.

DBA: Refers to Database Administrator, a position that covers a range of responsibilities to foster a departmental approach to the definition, inventory and storage, and access of data held by divisions throughout the department.

GIS: Refers to "Geographic Information Systems", electronic mapping and space related database applications.

IT: Refers to "Information Technology" which covers the whole of computing technologies including all data, application, support, networking, software, and hardware investments and activities of an organization.

ITM: Refers to "Information Technology Management" which includes those functions necessary to execute and manage computing related activities in an organization.

IRMB: Refers to "Information Resource Management Board", a standing committee composed of representatives throughout DEHNR charged with high level advisory and regulatory oversight of IT in DEHNR.

IRMC: Refers to Information Resources Management Committee, a state level organization charged with the development and enforcement of state-wide IT policies and procedures.

IRMT: Refers to the "Information Resource Management Team", a team composed of representatives from different DEHNR divisions charged with a review of current IT operations in DEHNR and the development of change recommendations.

LAN: Refers to "Local Area Network", a networked configuration of computers across a limited physical space.

PIM: Refers to "Personal Information Manager", software developed to manage day to day activities like appointments, addresses, and to-do lists.

QA: Refers to "Quality Assurance", the IT function that reviews the development of applications for adherence to the departmental development methodology and generally assures high quality development practices.

RAM: Refers to "Random Access Memory", electronic, high-speed memory in a computer.

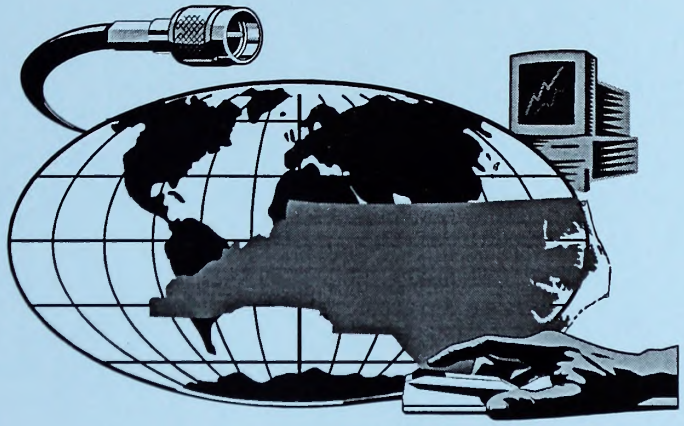
SDLC: Refers to "System Development Life Cycle", the life cycle associated with the development and maintenance of a specialized application.

SIPS: Refers to "State Information Processing Services", a contract-based organization charged with providing computing services for state agencies.

WAN: Refers to "Wide Area Network", a networked configuration of computers and networks that extent over widespread distances.

# IRMT REVIEW AND RECOMMENDATIONS FOR DEHNR INFORMATION TECHNOLOGY MANAGEMENT

## VOLUME II - PHASED IMPLEMENTATION



FEBRUARY 1996

# A PHASED IMPLEMENTATION

The IRMT has distributed its report to senior DEHNR leadership to solicit their feedback. Although senior management was, in general, supportive of the report's recommendations, concern was expressed that the department may not be able to fund the recommendations with existing departmental resources or with a single one-time, large request from the legislature. The IRMT is sensitive to this issue, and as a result, revisits the resource request in this volume. The resource request is divided into three phases for review. The first phase would include items to be funded by existing resources during this current fiscal year. The second would cover the fiscal year, 1996-97, and the third would be fiscal year 1997-98. In addition, the IRMT was asked to consider a worst case scenario where little or no additional funding could be found. Finally, concern was also expressed that the recommended organizational structure, where the CIO and Director of IT Services reported to the Deputy Secretary and to the Assistant Secretary for Administration respectively, could lead to decision-making conflicts. In response, the IRMT has also included an alternative organizational structure in this volume.

## POSITIONS BY PHASE

Positions were assigned to the different phases with the current financially constrained environment in mind and with the recognition that a critical mass of IT support is essential given the interrelated, integrated nature of IT support services. The IRMT was also sensitive to the mandates issued by the IRMC.

First, the following IT functions were identified as priorities: 1) database administration, 2) planning & policy, 3) quality assurance and project management (SDLC methodology), 4) applications support, 5) IT professionals training, 6) telecommunications, and 7) help desk and LAN support for 14th floor.

The IRMT believes that functions 1-5 are essential if the department is to comply with IRMC mandates associated with the development and enforcement of standard departmental policies and procedures. In particular, these functions will be necessary if the department is to adopt and disseminate an effective applications development methodology. The IRMT also believes the total staffing of these functions (across the three phases) to be a "bare bones" infrastructure necessary to develop a set of truly integrated IT support services. Function 6 is critical if the department is to benefit from a distributed computing

environment. Finally, Function 7 responds to a pervasive IT conundrum - that benefits of information technologies can only be truly appreciated by using the technologies while investment in the technologies often only occurs when the benefits are well known. Technical support for the 14th floor is intended to provide decision-makers with a real appreciation for what's possible with a well-supported system, thereby further sensitizing them to the costs to the department as a whole of poorly supported computing demands. Noted below is the proposed, phased staffing of IT implementation. New positions are shaded.

**PHASE I (FY95/96), PHASE II (FY96/97), PHASE III, (FY97/98) POSITIONS**

| Position | Phase I Positions | Phase II Positions | Phase III Positions |
|---|---|---|---|
| **PLANNING & POLICY** | | | |
| CIO | 1 | | |
| Policy Data Admin. | .5 | 1 | |
| Policy/Plan. Generalist | .5 | Note, ½ time Data Admin. & Plan. Generalist becomes full-time Plan. Generalist. | 1 |
| Quality Assurance | 1 contracted | 1 | 1 |
| Administrative Assistant | .5 | | |
| Clerical | .5 | | |
| **IT SERVICES** | | | |
| ITS Director | 1 | | |
| Administrative Assistant | .5 | | |
| Clerical | .5 | | |
| **Data Administration** | | | |
| Senior DBA | 1 | 1 | |
| Staff DBA | 1 | 1 | 1 |
| Data Entry | 1 contracted | 1 contracted | 1 |
| **14th Floor Support** | | | |
| LAN Administrator | 1 | | |

| Position | Phase I Positions | Phase II Positions | Phase III Positions |
|---|---|---|---|
| Help Desk | 1 contracted | 2 | |
| **Telecommunications** | | | |
| Senior WAN/telephony | 1 | | |
| WAN/telephony | 1 | | |
| Systems Integrator | 1 | 1 | |
| Lead LAN administrator | 1 | | |
| Trouble Shooter / Coordinator | 1 | 1 | |
| Archdale-LAN administrators (in addition to 14th floor support) | 2 | | |
| Regional LAN administrators | 7 | | |
| **Technology Assess.** | | | |
| Technology Assessment | | 1 | |
| **Software Contract Administration** | | | |
| Contract Administrator | 1 | | |
| Contract Admin. Support | | 2 | |
| **Help Desk** | | | |
| Help Desk Manager | | 1 | |
| Help Desk Staff | | 6 | |
| **Training** | | | |
| Training Coordinators | | 2 | |
| **Applications Development & Maintenance** | | | |
| Applications Development Manager | 1 | | |
| Project Management | 2 | 3 | |

| Position | Phase I Positions | Phase II Positions | Phase III Positions |
|---|---|---|---|
| Systems Analysts (78) | 1 | 1 | |
| Systems Analysts (76) | 1 | 2 contracted | 2 |
| Program./Analysts | 3 *(2 of 3 new)* | 8 contracted | 8 |
| Technical Writers | | 1 | 1 |
| Clerical | | 1 | |
| **Security/Disaster Recovery** | | | |
| Security/Disaster Recovery | 1 | 2 | |

The IRMT notes that in the "Applications Development and Maintenance" section of the table, eight analyst positions are contract employees in Phase II. These positions are then converted into regular, full-time positions in Phase III. The IRMT has suggested this solution because a significant number of applications must be maintained and developed over the three phases of the proposed IT implementation. At the same time, the IT reorganization during Phases I and II will require that some of the existing applications related positions be used to support other IT functions. Contract personnel would be used to provide the applications support during Phase II as a bridge to the regular staffing in Phase III. This bridge is an attempt to avoid requests for too many new positions during the second Phase. It is not intended as a long term solution. Contractors are more expensive, and their temporary relationship to the department can lead to more time consuming applications maintenance/upgrades.

The following table is an estimated budget for implementing the three phases. A detailed summary of the funding strategy is in Volume III Appendix H.

| ESTIMATED BUDGET | | | |
|---|---|---|---|
| | PHASE I | PHASE II | PHASE III |
| Salary needed | $249,180.00 | $929,035.00 | $490,146.00 |
| Social Security needed | $19,062.00 | $71,071.00 | $37,496.00 |
| Retirement needed | $26,986.00 | $100,614.00 | $53,083.00 |
| Hospitalization needed | $10,416.00 | $48,608.00 | $26,040.00 |
| Contracts | $355,000.00 | $774,000.00 | $696,000.00 |
| Telephone & wiring | $3,500.00 | $31,200.00 | $32,900.00 |
| Travel | $25,000.00 | $50,000.00 | $50,000.00 |
| Staff Development | $49,000.00 | $150,000.00 | $150,000.00 |
| Office Rental | $34,000.00 | $118,000.00 | $160,000.00 |
| Equipment-Office | $8,000.00 | $28,000.00 | $14,000.00 |
| Data Processing Equipment | $136,200.00 | $286,700.00 | $132,500.00 |
| Sips Charges | $10,400.00 | $90,000.00 | $120,000.00 |
| **Total** | **$926,744.00** | **$2,677,228.00** | **$1,962,165.00** |

**WORST CASE SCENARIO**

The IRMT was asked to give its recommendation should the department be unable to allocate additional resources to ITM functions. In response, the IRMT recommends that the existing organization be left as it is and that priorities be established such that existing staff have more specific, less overwhelming responsibilities. The IRMT believes that the current staffing is already well below the level necessary to provide adequate customer support to the department. To attempt to add functions beyond those already supported would be very risky, in all probability leading to further demoralization of IT staff and to the failure of major applications or systems.

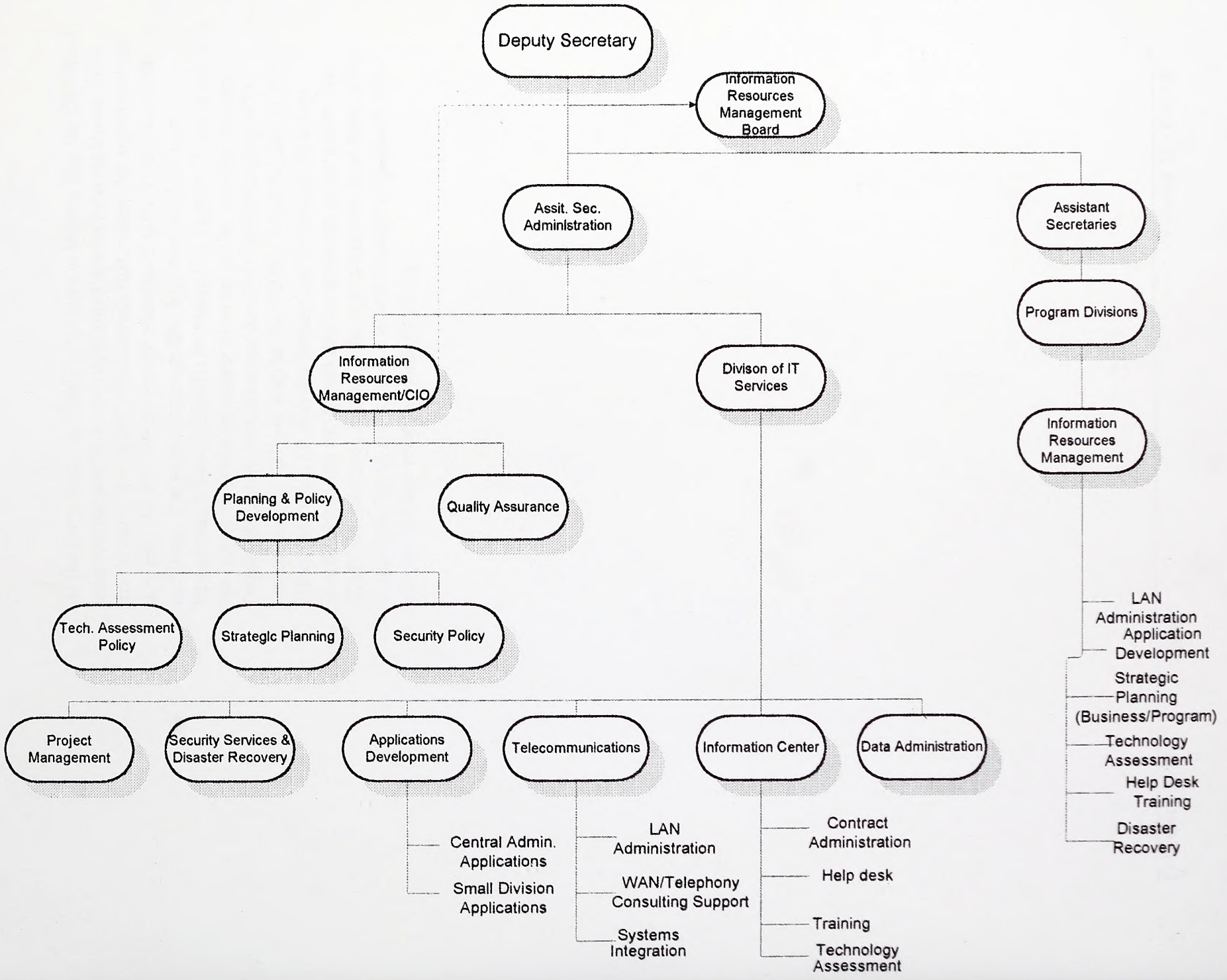
Although the bulk of the IT staff is nominally dedicated to applications development and maintenance, in fact, they provide many other IT services including such things as third party software support, LAN support, and training. These services are provided ad hoc, often as personal favors. If no additional resources are provided, the IRMT recommends that senior management support the ITS Director in firmly setting priorities for existing staff such that the IT staff provides services directly related to their job descriptions and that the applications support personnel work only on the applications that are determined to be of highest priority to the department.

## ALTERNATIVE ORGANIZATION

In volume I, the IRMT recommended the organization of ITM functions such that the Office of Information Resource Management (OIRM) and the Chief Information Officer report directly to the Deputy Secretary. Information Technology Services (ITS) and its Director would report to the Assistant Secretary for Administration. On the one hand, the OIRM reported to the Deputy Secretary because regular communication with the department's senior leadership would be necessary both to anticipate the department's strategic IT needs and to surface important IT issues in a timely, articulate manner. On the other hand, ITS provides support services like those in other administrative divisions, and as such, would appropriately report to the Assistant Secretary.

However, concern over possible decision making conflicts between the CIO and Director of ITS have emerged. These are sufficiently strong to warrant an alternative organizational scenario. This alternative is represented on the following page. In general, the ITM functions remain unchanged, but the CIO and the associated OIRM now report to the Assistant Secretary for Administration along with the Director of ITS. In this scenario the Assistant Secretary would arbitrate any disagreements.

# ITM FUNCTIONS and ORGANIZATION CHART



At the same time, the IRMT continues to believe that the CIO must have regular access to the department's senior management. With this in mind, the IRMT recommends that, under this organizational scenario, the CIO be in regular attendance at the Executive staff meetings. It also recommends that Information Resource Management Board (IRMB) be chaired by Deputy Director and that the IRMB be given the authority to set policy. In this way the Deputy Secretary would have a thorough understanding of IT issues, and the CIO, as staff to the IRMB, would be able to more effectively align IT with the department's strategic direction. Finally, assuming the IRMB has the authority to set policy, the IRMT recommends that all field representatives be at least at the supervisory level, ensuring the IRMB represents divisions with people who are versed in policy making.

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